

Details of Cavity Polarimeters for MIT-Bates and RHIC

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A cavity mode has been reported[1,2] that permits spin-dependent energy to be extracted from a polarized beam without cancellation between contributions from the time and space gradients of the cavity field. In the mode under consideration the magnitude of the Stern-Gerlach force experienced by a magnetic moment traversing the cavity varies as the square of the relativistic factor γ , so that the signal power varies as the fourth power of γ . In addition, the interaction of this cavity mode with the beam charge varies as the inverse of the interaction with the magnetic moment, so that the background due to the beam charge varies as the inverse fourth power of γ . The possibility is thus opened for very fast, accurate, and inexpensive polarimetry at accelerators like MIT-Bates[3] and RHIC. In addition, it might become possible to seriously consider Stern-Gerlach polarization of beams at LHC. We present details of polarimeters for the electron storage ring at MIT-Bates and the polarized proton beam at RHIC.

[1] M. Conte et al, "Stern-Gerlach Interaction in Particle Beams", Spin2000, Osaka.

[2] M. Conte et al, "The Stern-Gerlach Interaction between a travelling particle and a time varying magnetic field" http://xxx.lanl.gov/list/physics/0003_preprint/0003069

[3] P. Cameron et al, "Proposal for a Cavity Polarimeter at MIT-Bates" PAC2001, NY.